



Announcement of Opportunity Astrophysics Explorers Program

2019 Small Explorer (SMEX) Full Missions Evaluation Plan

April 16, 2019

***Amended: September 17, 2019
(Changes in Bold Italics on page 54)***



Outline

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Introduction



Introduction

- This Astrophysics SMEX Evaluation Plan covers evaluation information from the Announcement of Opportunity (AO) and from the evaluation processes conducted by the Science Panel and the Technical Management and Cost (TMC) Panel.
- The AO Cost Cap for an Astrophysics Small Explorer mission is \$145 million in NASA Fiscal Year (FY) 2020 dollars, not including the cost for access to space but not including nor any contributions.
- This Evaluation Plan describes a two-step competitive process to selection.
- The approval page for the Evaluation Plan is on page 60.

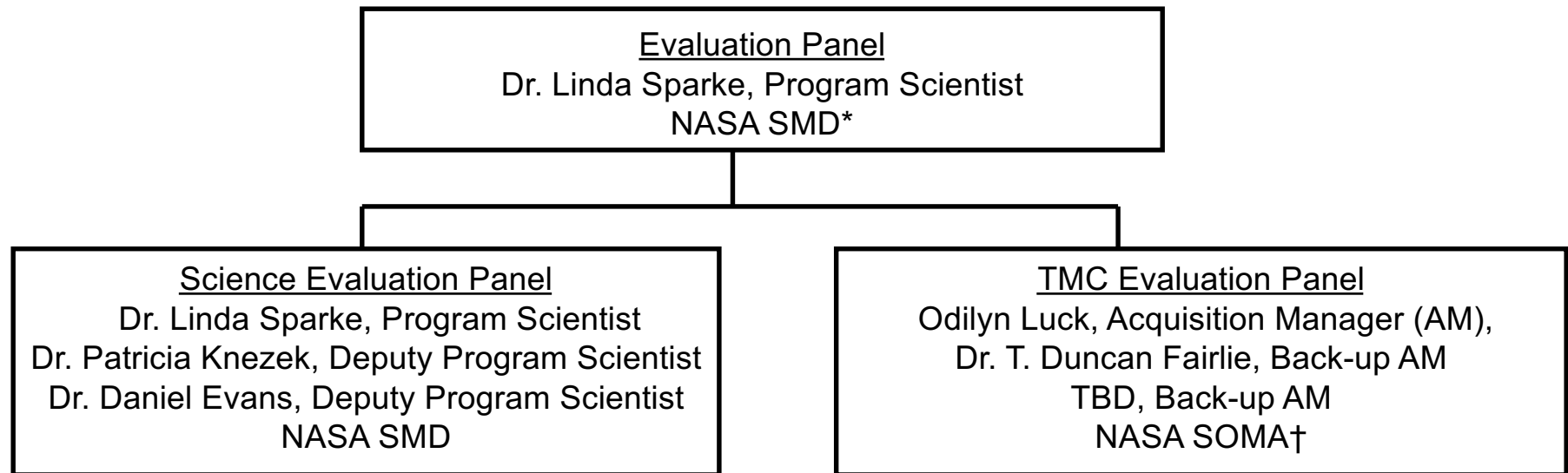


2016 Astrophysics SMEX Solicitation

- All investigations proposed in response to this solicitation must support the goals and objectives of the Astrophysics Explorers Program, must be implemented by Principal Investigator (PI) led investigation teams, and must be implemented through the provision of complete spaceflight missions.
 - Only AO-provided launch services may be proposed. These include a dedicated launch as described in the ELV Launch Services Information Summary document posted in the Program Library, and secondary launches utilizing one or more ports on an Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) or ESPA Grande, to Low Earth Orbit or Geostationary Transfer Orbit (Section 5.9.2.2). These may be rideshares on government or commercial launches.
 - NASA will provide accommodations on the International Space Station (ISS), as well as transportation to the ISS; NASA will provide transport and payload hosting on the lunar Gateway.
 - The cost of all AO-provided access to space is outside the PI-Managed Mission Cost.
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Evaluation Organization

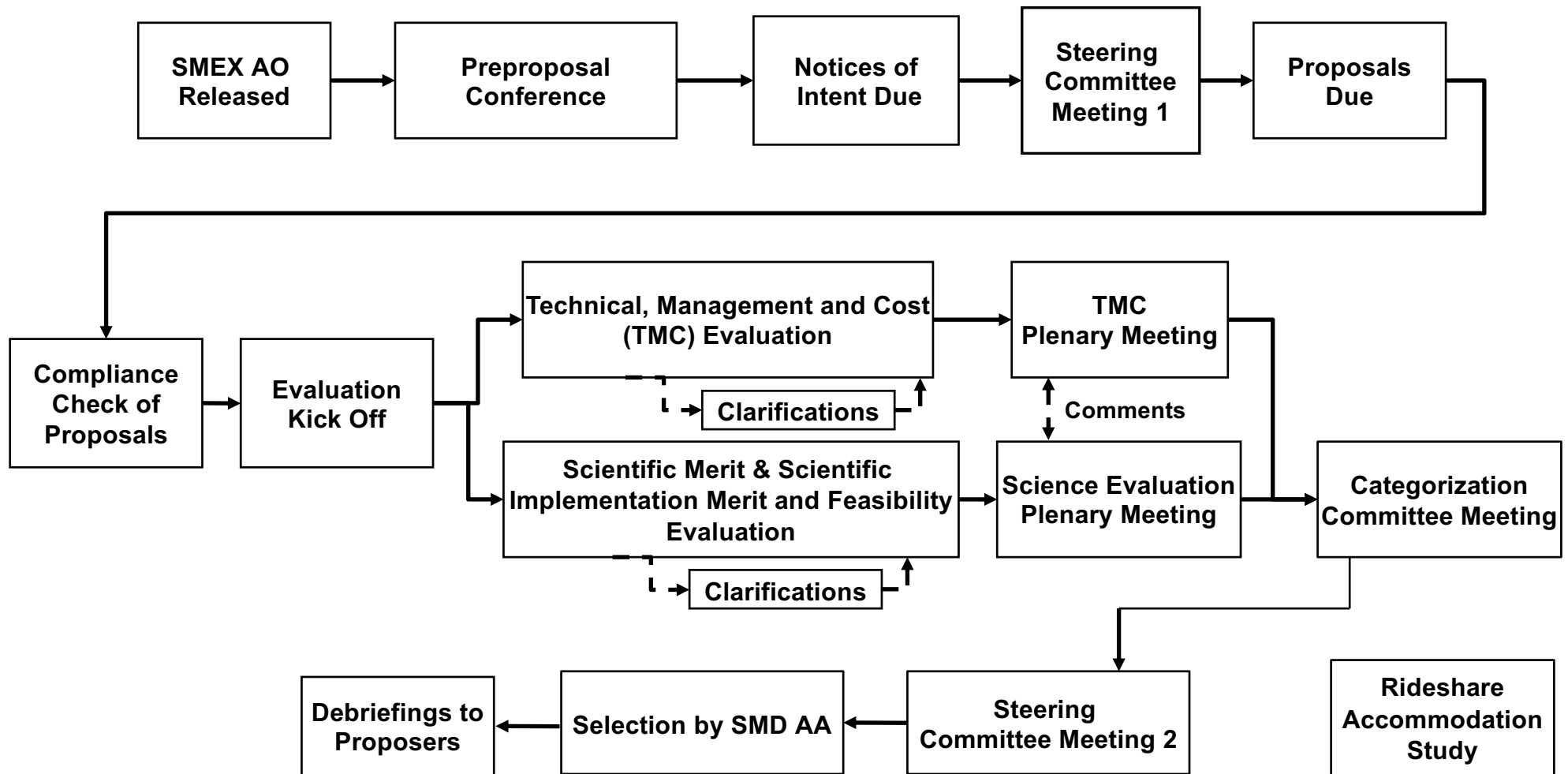


* Science Mission Directorate

† Science Office for Mission Assessments



Proposal Evaluation Flow





General Evaluation Requirements and Compliance



Principles for Evaluation

- All proposals are to be treated fairly and equally.
- Merit and Risk are to be assessed on the basis of the material in the proposal and the clarification process.
- Ratings shall reflect the written strengths and weaknesses.
- Everyone involved in the evaluation process is expected to act in an unbiased objective manner; advocacy for particular proposals is not appropriate.

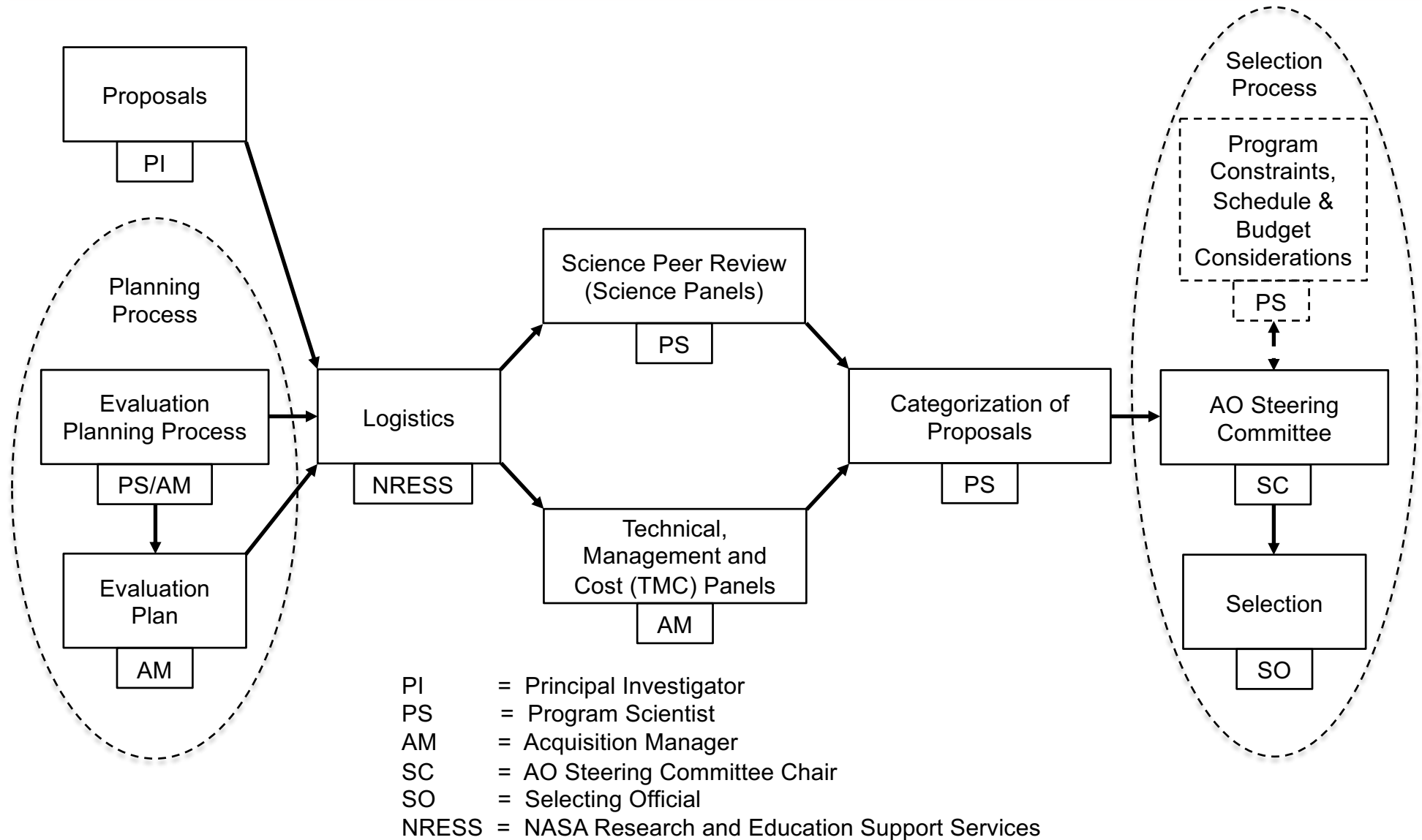


General Evaluation Ground Rules

- All proposals will be evaluated to uniform standards established in the 2019 Astrophysics SMEX AO, and without comparison to other proposals.
- All evaluators will be experts in the areas that they evaluate.
- Specialist Evaluators (to provide special technical expertise to the TMC Panel) and non-panel/mail-in Reviewers (to provide special science expertise to the Science Panels) may be utilized, respectively, based on need for expertise in a specific technology or science that is proposed.



Evaluation Responsibilities





Conflicts of Interest (COI) Prevention Requirements

- NRESS will cross-check all the Science Panel members against the lists of personnel and organizations identified in each proposal submitted to determine whether any organizational Conflict of Interest (COI) exists.
- Cornell Technical Services (CTS) will cross-check all TMC Panel members against the lists of personnel and organizations identified in each proposal submitted to determine whether any organizational COI exists.
- Additionally, all evaluators must divulge any other financial, professional, or potential personal conflicts of interest, and whether they work for a profit-making company that directly competes with any profit-making proposing organization.
- All Civil Service evaluators will self-certify their COI status by reviewing a combined listing of individuals and organizations associated with the SMEX proposals. The TMC evaluators must notify the SOMA Acquisition Managers in case there is a potential conflict. The Science evaluators must notify the Program Scientist in case of a potential conflict.



Conflicts of Interest (COI) Prevention Requirements

- All known conflict of interest issues are documented and a COI Mitigation Plan is developed to minimize the likelihood that an issue will arise in the evaluation process. Any potential COI issue is discussed with the Program Scientist and the SMD Deputy Associate Administrator for Research and documented in the COI Mitigation Plan. All determinations regarding possible COIs that arise will be logged as an appendix to the COI Mitigation Plan.
- If any previously unknown potential conflict of interest arises during the evaluation, the conflicted member(s) will be notified to stop evaluating proposals immediately, and the Panel Chair will be notified immediately. If a COI is confirmed, the conflicted member(s) will be immediately removed from the evaluation process, and steps will be taken expeditiously, to remove, mitigate, or accept any actual or potential bias imposed by the conflicted member(s). The steps will be documented in the COI Mitigation Plan.
- Members of the Science and TMC panels are prohibited from contacting anyone outside their panel for scientific/technical input, or consultation, without the prior approval of the Program Scientist.



Proprietary Data Protection Requirements

- All proposal and evaluation materials are considered proprietary. Viewing of proposal materials will be only on a need-to-know basis.
- Each evaluator will sign a Non-Disclosure Agreement (NDA) that must be on file at NRESS prior to any proposals being distributed to that evaluator.
- The proposal materials that each evaluator has access to is recorded.
- Evaluators are not permitted to discuss proposals with anyone outside their Science or TMC Panel.
- All proprietary information that must be exchanged between evaluators will be exchanged *via* the secure NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES), *via* the secure Remote Evaluation System (RES), *via* the secure NASA Large File Transfer (LFT) system, *via* secure WebEx, *via* NASA Google docs or *via* encrypted email, parcel post, fax, or regular mail. Weekly teleconferences among TMC Panel evaluators will be conducted *via* a teleconference line known only to the evaluators.
- Evaluators' electronic and paper evaluation materials will be deleted/destroyed when the evaluation process is complete. Archival copies will be maintained in the NASA SOMA vault.



Investigation Evaluation Criteria

- Evaluation Criteria from 2019 Astrophysics SMEX AO:
 1. Scientific Merit of the Proposed Investigation (Section 7.2.2);
 2. Scientific Implementation Merit and Feasibility of the Proposed Investigation (Section 7.2.3);
 3. TMC Feasibility of the Proposed Mission Implementation, including Cost Risk (Section 7.2.4).
- Weighting: the first criterion is weighted approximately 40%; the second and third criteria are weighted approximately 30% each.
- Other Selection Factors (Section 7.3):
 - Programmatic factors
 - PI-Managed Mission Cost



Compliance Checklist

2019 Astrophysics SMEX AO

Appendix F



Compliance Criteria

Administrative:

1. Electronic proposal submitted through NSPIRES on time
2. Proposal on CD-ROM received on time
3. Original signature of PI and authorizing official included
4. Meets page limits
5. Meets general requirements for format and completeness (one file no larger than 40 MB, maximum 55 lines text/page, maximum 15 characters/inch, no smaller than 12-point font)
6. Required appendices included; no additional appendices
7. Budgets are submitted in the required formats
8. All individual team members who are named on the cover page indicate their commitment through NSPIRES
9. All export-controlled information has been identified
10. Restrictions Involving China acknowledged on Electronic Cover Page



Compliance Criteria (2)

Scientific:

- 11. Addresses solicited science research programs
- 12. Requirements traceable from science to instruments to mission
- 13. Appropriate data archiving plan
- 14. Baseline science mission and threshold science mission defined



Compliance Criteria (3)

Technical:

15. Complete spaceflight mission (Phases A-F) proposed
16. Team led by a single PI
17. PI-Managed Mission Cost within AO Cost Cap
18. Phase A costs within Phase A cost limit
19. Contributions within contribution limit
20. Co-investigator costs in budget
21. Launch date prior to launch deadline
22. Includes table describing non-U.S. participation
23. Includes letters of commitment from funding agencies for non-U.S. participating institutions
24. Includes letters of commitment from all U.S. organizations offering contributions.
25. Includes letters of commitment from all major partners and non-U.S. institutions providing contribution of efforts of anyone on the Proposal Team.



Science Evaluation



Science Panel Composition and Organization (1)

- The Program Scientist leads the Science Panel
- The Science Panel evaluates Science Merit (7.2.2) and Scientific Implementation Merit and Feasibility (7.2.3).
- Science evaluators are typically, but not exclusively, recruited from the academic, governmental, and industrial research communities.
- Before the Science Panel is finalized, an initial Steering Committee reviews
 - plans to recruit a diverse body of science evaluators
 - how science evaluator conflicts of interest will be handled and documented
 - how science evaluators will be compensated
 - any other process issues related to the science review.



Science Panel Composition and Organization (2)

- The science evaluation will be conducted *via* one separate Science Panel, and sub-panels may be employed, depending on the number and variety of proposed investigations.
 - Any sub-panel will be led by a NASA Civil Servant and may be co-chaired by a member from the scientific community.
 - Sub-panels may have an Executive Secretary.
- Each proposal will be reviewed by assigned panel members.
 - The Lead Reviewer for each proposal will lead the discussion. At least two secondary (supporting) reviewers will be assigned to each proposal.
 - At the request of the Lead Reviewer, a Supporting Reviewer will take notes on the discussion.
- The TMC Panel may provide comments and questions to the Science Panel, and vice versa.
- The Science Panels may request clarifications from proposers on any Potential Major Weaknesses (PMWs) in Science Merit (Form A) or Science Implementation Merit and Investigation Feasibility (Form B) that are identified during the evaluation process.



Science Panel Procedures

- The Science Panel will review a version of the proposal in which any export controlled material has been redacted. Proposers are required to indicate such material; NRESS will redact the proposal pdf.
 - Each Science Panel member will review Proposals as directed by the Chair.
 - If special science expertise is required, the Science Panels may utilize non-panel/mail-in reviewers to assist with one or more proposals.
 - Non-panel/mail-in reviewers will evaluate only those parts of proposals pertinent to their scientific specialties.
 - Each proposal may be discussed by the reviewers in a telecon.
 - Each assigned reviewer provides an individual review prior to the telecon.
 - The telecon discusses the proposal and the individual reviews, including those from non-panel reviewers.
 - No overall merit grade is assigned at the telecon.
 - Following the telecon,
 - The Lead Reviewer generates a Draft Evaluation including draft findings, based on the individual evaluations and the discussion.
 - Reviewers use secure document exchange to develop the PMWs for clarification.
 - A second telecon may be held to consider clarification responses.
-



Science Panel Procedures (2)

- A Science Panel Meeting will be held upon completion of individual reviewer evaluations for all proposals.
 - The Science Panel (or sub-panel) will compile all of the findings for each proposal.
 - For each proposal, the Chair or designated Lead Reviewer will lead the discussion, summarize the proposed investigation, and document the results.
 - The PMWs clarifications provided by the PIs will be considered and the Science Panel (or sub-panel) will compose a panel summary review for each proposal.
 - Evaluations of all proposals are reviewed during the Science Panel Meeting to ensure that standards have been applied uniformly and in an appropriate and fair manner.
 - After the discussion, each member of the Panel or sub-panel assigns a merit rating for Science (Form A) and for Science Implementation and Feasibility (Form B) to each proposal. Non-panel reviewers do not assign ratings.



Typical Science Panel Products

For each proposal, this process results in Form A and Form B, each of which includes

- Proposal title, PI name, and submitting organization;
- Proposal summary;
- Based on findings, adjectival ratings from each panel member for Intrinsic Scientific Merit (Form A) and for Science Implementation Merit and Investigation Feasibility (Form B). Adjectival ratings range from “Excellent” to “Poor”, including half-step ratings (e.g. Very Good/Good);
- Summary rationale for the median rating; if the median rating falls between the two half-steps, the rating closer to the mean is adopted; if the mean and median are equal, the score will be “rounded” towards the less favorable grade.
- Narrative findings, identified as major or minor strengths or weaknesses;
- Comments to PI, comments to NASA. (optional)



Science Panel Evaluation Factors

Criterion A: Scientific Merit of the Proposed Investigation

- Factors from 2019 Astrophysics SMEX AO section 7.2.2
 - Factor A-1. Compelling nature and scientific priority of the proposed investigation's science goals and objectives.
 - Factor A-2. Programmatic value of the proposed investigation.
 - Factor A-3. Likelihood of scientific success.
 - Factor A-4. Scientific value of the Threshold Science Mission.
 - Factor A-5. Scientific value of any Science Enhancement Options (SEOs), if proposed.



Science Panel Evaluation: Factor A-1

Compelling nature and scientific priority of the proposed investigation's science goals and objectives. This factor includes the clarity of the goals and objectives; how well the goals and objectives reflect program, Agency, and national priorities; the potential scientific impact of the investigation on program, Agency, and national science objectives; and the potential for fundamental progress, as well as filling gaps in our knowledge relative to the current state of the art.



Science Panel Evaluation: Factor A-2

Programmatic value of the proposed investigation. This factor includes the unique value of the investigation to make scientific progress in the context of other ongoing and planned missions; the relationship to the other elements of NASA's science programs; how well the investigation may synergistically support ongoing or planned missions by NASA and other agencies; and the necessity for a space mission to realize the goals and objectives.



Science Panel Evaluation: Factor A-3

Likelihood of scientific success. This factor includes how well the anticipated measurements support the goals and objectives; the adequacy of the anticipated data to complete the investigation and meet the goals and objectives; and the appropriateness of the mission requirements for guiding development and ensuring scientific success.



Science Panel Evaluation: Factor A-4

Scientific value of the Threshold Science Mission. This factor includes the scientific value of the Threshold Science Mission using the standards in the first factor of this section and whether that value is sufficient to justify the proposed cost of the mission.



Science Panel Evaluation: Factor A-5

Scientific value of any Science Enhancement Options (SEOs), if proposed. This factor includes assessing the potential of the selected activities to enlarge the impact of the investigation.

This factor will not be considered in the overall criterion rating.



Science Panel Evaluation Factors

Criterion B: Scientific Implementation Merit and Feasibility of the Proposed Investigation

- Factors from 2019 Astrophysics SMEX AO section 7.2.3
 - Factor B-1. Merit of the instruments and mission design for addressing the science goals and objectives.
 - Factor B-2. Probability of technical success.
 - Factor B-3. Merit of the data analysis, data availability, and data archiving plan.
 - Factor B-4. Science resiliency.
 - Factor B-5. Probability of science team success.
 - Factor B-6. Merit of any science enhancement options (SEOs), if proposed.



Science Panel Evaluation: Factor B-1

Merit of the instruments and mission design for addressing the science goals and objectives. This factor includes the degree to which the proposed mission will address the goals and objectives; the appropriateness of the selected instruments and mission design for addressing the goals and objectives; the degree to which the proposed instruments and mission can provide the necessary data; and the sufficiency of the data gathered to complete the scientific investigation.



Science Panel Evaluation: Factor B-2

Probability of technical success. This factor includes the maturity and technical readiness of the instruments or demonstration of a clear path to achieve necessary maturity; the adequacy of the plan to develop the instruments within the proposed cost and schedule; the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks; the likelihood of success in developing any new technology that represents an untested advance in the state of the art; the ability of the development team - both institutions and individuals - to successfully implement those plans; and the likelihood of success for both the development and the operation of the instruments within the mission design.



Science Panel Evaluation: Factor B-3

Merit of the data analysis, data availability, and data archiving plan. This factor includes the merit of plans for data analysis and data archiving to meet the goals and objectives of the investigation; to result in the publication of science discoveries in the professional literature; and to preserve data and analysis of value to the science community. Considerations in this factor include assessment of planning and budget adequacy and evidence of plans for well-documented, high-level data products and software usable to the entire science community; assessment of adequate resources for physical interpretation of data; reporting scientific results in the professional literature (e.g., refereed journals); and assessment of the proposed plan for the timely release of the data to the public domain for enlarging its science impact.



Science Panel Evaluation: Factor B-4

Science resiliency. This factor includes both developmental and operational resiliency. Developmental resiliency includes the approach to descoping the Baseline Science Mission to the Threshold Science Mission in the event that development problems force reductions in scope. Operational resiliency includes the ability to withstand adverse circumstances, the capability to degrade gracefully, and the potential to recover from anomalies in flight.



Science Panel Evaluation: Factor B-5

Probability of science team success. This factor will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the mission design in light of any proposed instruments. The role of each Co-Investigator and collaborator will be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is and/or collaborators who do not have a well defined and appropriate role may be cause for downgrading during evaluation.



Science Panel Evaluation: Factor B-6

Merit of any science enhancement options (SEOs), if proposed.
This factor includes assessing the appropriateness of the selected activities to enlarge the science impact of the mission and the costing of the selected activities.

This factor will not be considered in the overall criterion rating.



Science Evaluation Products: Findings

- **Major Strength:** A facet of the implementation response that is judged to be of superior merit and can substantially contribute to the ability of the project to meet its scientific objectives.
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its scientific objectives.
- **Minor Strength:** A strength that is worthy of note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of merit.
- **Minor Weakness:** A weakness that is sufficiently worrisome to note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of merit.



Form A and B Grade Definitions

- **Excellent:** A comprehensive, thorough, and compelling proposal of exceptional merit that fully responds to the objectives of the AO as documented by numerous and/or significant strengths and having no major weaknesses.
- **Very Good:** A fully competent proposal of very high merit that fully responds to the objectives of the AO, whose strengths fully outbalance any weaknesses.
- **Good:** A competent proposal that represents a credible response to the AO, having neither significant strengths nor weaknesses and/or whose strengths and weaknesses essentially balance.
- **Fair:** A proposal that provides a nominal response to the AO but whose weaknesses outweigh any perceived strengths.
- **Poor:** A seriously flawed proposal having one or more major weaknesses (e.g., an inadequate or flawed plan of research or lack of focus on the objectives of the AO).

Note: Only Major Findings are considered in the adjectival rating.



TMC Evaluation Requirements



TMC Panel Composition and Organization

- The Acquisition Manager, who is a Civil Servant in the NASA Science Office for Mission Assessments (SOMA) at NASA Langley Research Center (LaRC), leads the TMC Panel.
 - NASA SOMA works directly for NASA Headquarters and is firewalled from the rest of NASA LaRC.
- TMC Panel evaluators are a mix of the best non-conflicted contractors, consultants, and Civil Servants who are experts in their respective fields.
 - Evaluators read their assigned proposals.
 - Evaluators provide findings on their assigned proposals.
 - Evaluators provide ratings of proposals that reflect findings.
- Additionally, specialist evaluators may be called upon in cases where technical expertise that is not represented on the panel is needed.
 - Specialist Evaluators evaluate only those parts of a proposal that are specific to their particular expertise.
 - Specialist Evaluators provide only findings; they do not provide ratings.



TMC Panel Evaluation Factors

Criterion C: TMC Feasibility of the Proposed Mission Implementation, Including Cost Risk

- Factors from 2019 Astrophysics SMEX AO section 7.2.4
 - Factor C-1. Adequacy and robustness of the instrument implementation plan.
 - Factor C-2. Adequacy and robustness of the mission design and plan for mission operations.
 - Factor C-3. Adequacy and robustness of the flight systems.
 - Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.
 - Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk.



TMC Evaluation Factor C-1

Adequacy and robustness of the instrument implementation plan. The maturity and technical readiness of the instrument complement will be assessed, as will the ability of the instruments to meet mission requirements. This factor includes an assessment of the instrument design, accommodation, interface, heritage, and technology readiness. This factor includes an assessment of the instrument hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of the instrument complement. This factor also includes adequacy of the plans for instrument systems engineering and for dealing with environmental concerns. This factor includes an assessment of plans for the development and use of new instrument technology, plans for advanced engineering developments, and the adequacy of backup plans to mature systems within the proposed cost and schedule when systems having a TRL less than 6 are proposed.



TMC Evaluation Factor C-2

Adequacy and robustness of the mission design and plan for mission operations. This factor includes an assessment of the overall mission design and mission architecture, the spacecraft design and design margins (including margins for launch mass, delta-V, and propellant), the concept for mission operations (including communication, navigation/tracking/trajectory analysis, and ground systems and facilities), and the plans for launch services. This factor includes mission resiliency – the flexibility to recover from problems during both development and operations – including the technical resource reserves and margins, system and subsystem redundancy, and reductions and other changes that can be implemented without impact to the Baseline Science Mission.



TMC Evaluation Factor C-3

Adequacy and robustness of the flight systems. This factor includes an assessment of the flight hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, etc.). This factor includes an assessment of the adequacy of the plans for spacecraft systems engineering, qualification, verification, mission assurance, launch operations, and entry/descent/landing. This factor includes the plans for the development and use of new technology, plans for advanced engineering developments, and the adequacy of backup plans to ensure success of the mission when systems having a TRL less than 6 are proposed. The maturity and technical readiness of the spacecraft, subsystems, and operations systems will be assessed. The adequacy of the plan to mature systems within the proposed cost and schedule, the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks, and the likelihood of success in developing any new technologies will be assessed.



TMC Evaluation Factor C-4

Adequacy and robustness of the management approach and schedule, including the capability of the management team. This factor includes: the adequacy of the proposed organizational structure and WBS; the management approach including project level systems engineering; the roles, qualifications, and experience of the PI, PM, other named Key Management Team members, and implementing organization, mission management team, and known partners; the commitment, spaceflight experience, and relevant performance of the PI, PM, other named Key Management Team members, and implementing organization, mission management team, and known partners against the needs of the investigation; the commitments of partners and contributors; and the team's understanding of the scope of work covering all elements of the mission, including contributions. Also evaluated under this factor is the adequacy of the proposed risk management approach, including any risk mitigation plans for new technologies, any long-lead items, and the adequacy and availability of any required manufacturing, test, or other facilities. The approach to any proposed descoping of mission capabilities will be assessed against the potential science impact to the proposed Baseline Science Mission.



TMC Evaluation Factor C-4 (2)

Adequacy and robustness of the management approach and schedule, including the capability of the management team. ... The plans for managing the risk of contributed critical goods and services will be assessed, including the plans for any international participation, the commitment of partners and contributors, as documented in Letters of Commitment, and the technical adequacy of contingency plans, where they exist, for coping with the failure of a proposed cooperative arrangement or contribution. This factor also includes assessment of elements such as the relationship of the work to the project schedule, the project element interdependencies, the associated schedule margins, and an assessment of the likelihood of meeting the proposed launch readiness date. Also evaluated under this factor are the proposed project and schedule management tools to be used on the project.



TMC Evaluation Factor C-5

Adequacy and robustness of the cost plan, including cost feasibility and cost risk. Adequacy and robustness of the cost plan, including cost feasibility and cost risk. This factor includes elements such as cost, cost risk, cost realism, and cost completeness including assessment of the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work (covering all elements of the mission, including contributions and all elements associated with a non-NASA launch or rideshare provider, such as launch site payload processing and mission unique services). The adequacy of the cost reserves and understanding of the cost risks – including those associated with alternative access to space associated delay and/or opportunity uncertainty – will be assessed. This factor also includes an assessment of the proposed cost relative to estimates generated by the evaluation team using parametric models and analogies. Also evaluated under this factor are the proposed cost management tools to be used on the project.



TMC Panel Product: Form C

For each proposal, the TMC Evaluation will result in a Form C for Categorization, Steering, and Selection that contains:

- Proposal title, PI name, and submitting organization;
- An adjectival risk rating from each evaluator of “LOW Risk”, “MEDIUM Risk” or “HIGH Risk” for the TMC Feasibility of the Proposed Mission Implementation, Including Cost Risk, that is derived based on the findings;
- Summary rationale for the median risk rating;
- Narrative findings, identified as major or minor strengths or weaknesses;
- Comments to the Proposers, comments to the Selection Official, comments to the Accommodation Study team. (optional)



TMC Evaluation Product: Findings

Major and minor strengths and weaknesses are defined as follows:

- **Major Strength:** A facet of the implementation response that is judged to be well above expectations and can substantially contribute to the ability of the project to meet its technical requirements on schedule and within cost.
- **Minor Strength:** A strength that is worthy of note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of risk.
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its technical objectives on schedule and within cost.
- **Minor Weakness:** A weakness that is sufficiently worrisome to note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of risk.

Note: Findings that are considered “as expected” are not documented in the Form C.



TMC Evaluation Product: Risk Ratings

Based on the narrative findings, each proposal will be assigned one of three risk ratings, defined as follows:

- **LOW Risk:** There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation well within available resources.
- **MEDIUM Risk:** Problems have been identified, but are considered within the proposal team's capabilities to correct within available resources with good management and application of effective engineering resources. Mission design may be complex and resources tight.
- **HIGH Risk:** One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources.

Note: Only Major Findings are considered in the risk rating.



TMC Cost Analysis

- Initial cost analyses will be accomplished on the basis of information provided in the proposals (consistency, completeness, proposed basis of estimate, contributions, use full cost accounting, maintenance of reserve levels, and cost management, etc.).
- Cost will be evaluated with at least one cost model.
- Cost threats, risks, and risk mitigations will be analyzed.
- Cost realism (a.k.a. “cost risk”) is based on models, analogies, heritage, and grass roots information from proposals.
- Draft Cost Evaluation Summaries and Form Cs will be completed prior to the Plenary.
- During the TMC Plenary, the entire panel will participate in Cost deliberations:
 - All information from the entire evaluation process will be considered in the final cost assessment.
- Significant findings from the Cost Evaluation Summaries will be documented in the Cost Factor on Form C.



Cost Threat Matrix

- The *likelihood* and *cost impact*, if any, of each weakness is stated as “This finding represents a cost threat assessed to have an Unlikely/Possible/Likely/Very Likely/Almost Certain likelihood of a Minimal/Limited/Moderate/Significant/Very Significant cost impact being realized during development and/or operations.”
- The *likelihood* is the probability range that the *cost impact* will materialize.
- The *cost impact* is the current best estimate of the range of costs to mitigate the realized threat.
- The cost threat matrix below defines the adjectives used to describe the *likelihood* and *cost impact*.
- The minimum cost threat threshold for Phase E is set at \$1M.

		Cost Impact (CI, % of PI-Managed Mission Cost to complete Phases A/B/C/D (not including launch) or % of Phase E, not including unencumbered cost reserves)					
		Very Minimal (1%* < CI ≤ 2.5%)	Minimal (2.5% < CI ≤ 5%)	Limited (5% < CI ≤ 10%)	Moderate (10% < CI ≤ 15%)	Significant (15% < CI ≤ 20%)	Very Significant (CI > 20%)
Likelihood (L, %)	Almost Certain (L > 80%)						
	Very Likely (60% < L ≤ 80%)						
	Likely (40% < L ≤ 60%)						
	Possible (20% < L ≤ 40%)						
	Unlikely (L ≤ 20%)						

Note: For each proposal the percentages in the above table will be converted to dollars by the cost estimator.



Student Collaboration

- Proposals may define a Student Collaboration (SC) that is a separate part of the proposed investigation; see Requirements 53 and 54 in the 2019 Astrophysics SMEX AO Section 5.5.3.
- Per the 2019 Astrophysics SMEX AO section 7.2.3, Student Collaboration proposals, if any, will be evaluated only for the impact they have on science implementation feasibility to the extent that they are not separable; student collaboration proposals will not be penalized in Step 1 for any inherent higher cost, schedule, or technical risk, as long as the student collaboration is shown to be clearly separable from the implementation of the Baseline Science Mission. The intrinsic merit of student collaborations will not be evaluated at this time.



Evaluation: Clarification from Proposers

NASA will request clarification of potential major weaknesses (PMWs) identified by the “Science Merit,” “Scientific Implementation Merit and Feasibility of the Proposed Investigation” and “TMC Feasibility of the Investigation Implementation, Including Cost Risk” evaluation panels.

- NASA will request such clarification uniformly, from all proposers.
- All requests for clarification from NASA, and the proposer’s response, will be in writing.
- The ability of proposers to provide clarification to NASA is extremely limited, as NASA does not intend to enter into discussions with proposers.
- PIs whose proposals have no PMWs will receive an email informing them.
- The form of the clarifications is strictly limited to a few types of responses:
 - Identification of the locations in the proposal (page(s), section(s), line(s)) where the PMW is addressed.
 - Noting that the PMW is not addressed in the proposal.
 - Stating that the PMW is invalidated by information that is common knowledge and is therefore not included in the proposal.
 - Stating that the analysis leading to this PMW is incorrect and identifying a place in the proposal where data supporting a correct analysis may be found.
 - Stating that a typographical error appears in the proposal and that the correct data is available elsewhere inside of the proposal.
- The PI will be given at least 24 hours to respond to the request for PMWs clarifications. Any response that goes beyond a clarification will be deleted and will not be shown to the evaluation panel.



Categorization



Categorization

Upon completion of the evaluations, the results will be presented to the Categorization Committee, an *ad hoc* subcommittee of the SMD AO Steering Committee composed solely of Civil Servants and appointed by the SMD Associate Administrator.

This committee will consider the peer review results and, based on the evaluations, will categorize each proposal according to procedures required by NFS 1872.403-1(e). The categories are defined as:

- Category I. Well-conceived, meritorious, and feasible investigations pertinent to the goals of the program and the AO's objectives and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time and that data can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.



Categorization (2)

- Category II. Well-conceived, meritorious, and feasible investigations that are recommended for acceptance, but at a lower priority than Category I, whatever the reason.
- Category III. Meritorious investigations that require further development. Category III investigations may be funded for further development and may be reconsidered at a later time for the same or other opportunities.
- Category IV. Proposed investigations which are recommended for rejection for the particular opportunity under consideration, whatever the reason.



Evaluation Process Conclusion

- Once Categorization has been completed, the Evaluation is considered complete unless questioned by a subsequent Steering Committee review.
- The AO Steering Committee will conduct an independent assessment of the Evaluation and Categorization processes regarding their compliance to established policies and practices, as well as the completeness, self-consistency, and adequacy of all supporting materials.
- After the evaluation, but prior to the selection decision, NASA will perform an accommodation study of selectable rideshare investigation proposals to assess the extent to which the proposed secondary payload is compatible with the expected rideshare opportunities.



Selection Factors

- As stated in Section 7.3 of the AO, the Selection Official may take into account a wide range of programmatic factors in deciding whether or not to select any proposals and in selecting among selectable proposals, including, but not limited to, planning and policy considerations, available funding, programmatic merit and risk of any proposed partnerships, and maintaining a programmatic balance across the mission directorate(s).



Signature Page

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